

WHAT IS CLAIMED IS:

1. A storage-stable liquid concentrate for use with a fuel cell, wherein the concentrate comprises at least one metal hydride compound, a solvent comprising one or more polar solvent components, and at least one hydroxide ion providing compound, and wherein after storing the concentrate for 4 weeks at about 25 °C, not more than about 2 % of the at least one metal hydride compound have decomposed.
2. The concentrate of claim 1, wherein the at least one metal hydride compound is capable of at least one of undergoing anodic oxidation in a liquid fuel cell and undergoing decomposition with generation of hydrogen gas under conditions which promote a hydrolysis thereof.
3. The concentrate of claim 1, wherein the at least one metal hydride compound comprises at least one of alkali and alkaline earth metal hydrides, borohydrides and aluminum hydrides.
4. The concentrate of claim 1, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, $(\text{CH}_3)_3\text{NHBH}_3$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 .
5. The concentrate of claim 1, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , LiH , NaH , and KH .
6. The concentrate of claim 1, wherein the at least one metal hydride compound comprises at least one of NaBH_4 and KBH_4 .
7. The concentrate of claim 2, wherein the concentrate has a hydroxide ion concentration of at least about 7.5 moles per liter.

8. The concentrate of claim 6, wherein the concentrate has a hydroxide ion concentration of at least about 8 moles per liter.
9. The concentrate of claim 8, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.
10. The concentrate of claim 4, wherein the at least one hydroxide ion providing compound comprises one or more of alkali and alkaline earth metal hydroxides and ammonium hydroxide.
11. The concentrate of claim 7, wherein the at least one hydroxide ion providing compound comprises at least one of LiOH, NaOH, KOH, RbOH, CsOH, Ca(OH)₂, Mg(OH)₂, Ba(OH)₂, and NH₄OH.
12. The concentrate of claim 1, wherein the at least one hydroxide ion providing compound comprises at least one of NaOH and KOH.
13. The concentrate of claim 11, wherein the solvent comprises at least one of water, an aliphatic alcohol having up to about 6 carbon atoms and up to about 4 hydroxy groups, a C₂₋₄ alkylene glycol, a di(C₂₋₄ alkylene) glycol, a mono-C₁₋₄-alkyl ether of a C₂₋₄ alkylene glycol or di(C₂₋₄ alkylene) glycol, a di-C₁₋₄-alkyl ether of a C₂₋₄ alkylene glycol or di(C₂₋₄ alkylene) glycol, an aliphatic ether having up to about 6 carbon atoms, an aliphatic ketone having up to about 6 carbon atoms, and a C₁₋₃ alkyl ester of a C₁₋₃ alkanoic acid.
14. The concentrate of claim 5, wherein the solvent comprises at least one of water, methanol, ethanol, ethylene glycol, diethylene glycol, glycerol, acetone, methyl ethyl ketone, diethyl ketone, methyl acetate, ethyl acetate, dioxan, tetrahydrofuran, diglyme and triglyme.
15. The concentrate of claim 6, wherein the solvent comprises water.

16. The concentrate of claim 1, wherein the concentrate comprises at least one of NaBH_4 and KBH_4 in a total concentration of at least about 4 moles per liter, water and at least one of NaOH and KOH .

17. The concentrate of claim 16, wherein the concentrate comprises hydroxide ions in a concentration of at least about 8 moles per liter.

18. The concentrate of claim 1, wherein the concentrate consist essentially of at least one metal hydride compound selected from NaBH_4 , KBH_4 , LiBH_4 , $(\text{CH}_3)_3\text{NHBH}_3$, and NaCNBH_3 , a solvent which comprises water, and at least one of NaOH and KOH , and has a hydroxide ion concentration of at least about 8 moles per liter.

19. The concentrate of claim 18, wherein the concentrate, upon dilution thereof to a hydroxide ion concentration of not higher than about 6 moles per liter, contains a sufficient amount of the at least one metal hydride compound to be utilizable as at least one of a liquid fuel and a hydrogen generator for a fuel cell.

20. The concentrate of claim 13, wherein the concentrate, upon dilution thereof to a hydroxide ion concentration of about 6 moles per liter, contains the at least one metal hydride compound in a concentration of at least about 2 moles per liter.

21. The concentrate of claim 6, wherein the concentrate, upon dilution thereof to a hydroxide ion concentration of about 6 moles per liter, contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

22. The concentrate of claim 20, wherein the concentrate is substantially free of any fuel additives which adversely affect the stability of the at least one metal hydride compound.

23. The concentrate of claim 21, wherein the concentrate is substantially free of plasticizers, detergents and antifreeze.

24. The concentrate of claim 1, wherein the concentrate is substantially free of stabilizers for the at least one metal hydride compound.

25. The concentrate of claim 24, wherein upon storage of the concentrate for 1 year at about 25 °C, not more than about 5 % of the at least one metal hydride compound have decomposed.

26. The concentrate of claim 19, wherein upon storage of the concentrate for 1 year at about 25 °C, not more than about 3 % of the at least one metal hydride compound have decomposed.

27. The concentrate of claim 22, wherein upon storage of the concentrate for 1 year at about 25 °C, not more than about 2 % of the at least one metal hydride compound have decomposed.

28. A process for preparing a metal hydride containing liquid for use in a fuel cell from a storage-stable concentrate, wherein the process comprises combining (a) a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 7 moles per liter, and not more than about 2 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25 °C, and (b) a solvent in an amount of at least about 15 % by volume of the concentrate.

29. The process of claim 28, wherein combining (a) and (b) results in a hydroxide ion concentration of not higher than about 6 moles per liter.

30. The process of claim 29, wherein not more than about 0.5 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25 °C.

31. The process of claim 29, wherein the concentrate comprises the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

32. The process of claim 30, wherein the hydroxide ion concentration in the concentrate is at least about 8 moles per liter.

33. The process of claim 29, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, $(\text{CH}_3)_3\text{NHBH}_3$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 .

34. The process of claim 28, wherein the at least one metal hydride compound comprises at least one of NaBH_4 and KBH_4 .

35. The process of claim 28, wherein the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

36. The process of claim 35, wherein the solvent comprises at least one of water, methanol, ethanol, ethylene glycol, diethylene glycol, glycerol, acetone, methyl ethyl ketone, diethyl ketone, methyl acetate, ethyl acetate, dioxan, tetrahydrofuran, diglyme and triglyme.

37. The process of claim 32, wherein the concentrate comprises at least one of NaBH_4 and KBH_4 , water and at least one of NaOH and KOH .

38. The process of claim 36, wherein the concentrate, when diluted to a hydroxide ion concentration of about 6 moles per liter, contains at least about 2 moles per liter of the at least one metal hydride compound.

39. A process for providing a storage-stable packaged metal hydride containing liquid for use with a fuel cell, wherein the liquid comprises at least one metal hydride

compound and a polar solvent comprising a first portion and at least one second portion, the liquid having a hydroxide ion concentration of not higher than about 7 moles per liter, and wherein the process comprises providing a container having a first compartment and at least one second compartment, partially or completely filling the first compartment with a concentrate which differs from the liquid in that it comprises only the first portion of the polar solvent and in that it has a hydroxide ion concentration of at least about 8 moles per liter, and partially or completely filling the at least one second compartment with the at least one second portion of the polar solvent.

40. The process of claim 39, wherein combining the concentrate in the first compartment with the at least one second portion of the polar solvent in the at least one second compartment results in a hydroxide ion concentration of not higher than about 6 moles per liter.

41. The process of claim 40, wherein not more than about 1 % of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25 °C.

42. The process of claim 40, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

43. The process of claim 41, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, $(\text{CH}_3)_3\text{NHBH}_3$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 .

44. The process of claim 42, wherein the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

45. The process of claim 40, wherein the concentrate comprises at least one of NaBH_4 and KBH_4 , water, and at least one of NaOH and KOH .

46. The process of claim 41, wherein the concentrate, when diluted to a hydroxide ion concentration of about 6 moles per liter, contains at least about 2 moles per liter of the at least one metal hydride compound.

47. The process of claim 46, wherein the container is designed to allow a mixing of the concentrate and the at least one second component of the polar solvent inside the container.

48. A storage-stable packaged metal hydride containing liquid which is obtainable by the process of claim 39.

49. A container filled with a metal hydride containing liquid, wherein the container comprises a first compartment and at least one second compartment, the first compartment containing a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 8 moles per liter, and the at least one second compartment containing a solvent in an amount sufficient to result in a hydroxide ion concentration of not higher than about 7 moles per liter for the combination of the solvent in the at least one second compartment and the concentrate in the first compartment.

50. The container of claim 49, wherein the container is sealed and allows a mixing of the concentrate and the at least one second component of the polar solvent before discharging same from the container.

51. The container of claim 50, wherein the container is associated with instructions to allow the concentrate and the at least one second component of the polar solvent to mix before discharging same from the container.

52. The container of claim 49, wherein the container comprises an internal partition which defines the first compartment and the at least one second compartment.

53. The container of claim 49, wherein the first compartment is at least partially surrounded by the at least one second compartment.

54. The container of claim 49, wherein the at least one second compartment is at least partially surrounded by the first compartment.

55. The container of claim 52, wherein the amount of the solvent in the at least one second compartment is sufficient to result in a hydroxide ion concentration of not higher than about 6 moles per liter for a mixture of the solvent in the at least one second compartment and the concentrate in the first compartment.

56. The container of claim 55, wherein the concentrate contains the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

57. The container of claim 49, wherein the at least one metal hydride compound comprises at least one of NaBH_4 , KBH_4 , LiBH_4 , $\text{Be}(\text{BH}_4)_2$, $\text{Ca}(\text{BH}_4)_2$, $\text{Mg}(\text{BH}_4)_2$, $(\text{CH}_3)_3\text{NHBH}_3$, NaCNBH_3 , LiH , NaH , KH , CaH_2 , BeH_2 , MgH_2 , NaAlH_4 , LiAlH_4 , and KAlH_4 , and the concentrate further comprises at least one of LiOH , NaOH , KOH , RbOH , CsOH , $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, and NH_4OH .

58. The container of claim 55, wherein the concentrate comprises at least one of NaBH_4 and KBH_4 , water and at least one of NaOH and KOH .

59. The container of claim 57, wherein the concentrate, when diluted to afford a hydroxide ion concentration of about 6 moles per liter, will contain the at least one metal hydride compound in a concentration of at least about 2 moles per liter.

60. The container of claim 58, wherein the concentrate, when diluted to afford a hydroxide ion concentration of about 6 moles per liter, will contain the at least one metal hydride compound in a concentration of at least about 3 moles per liter.

61. A refilling device for a liquid fuel cell, wherein the device comprises the container of claim 49.

62. The device of claim 61, which is designed to be capable of accommodating a spent liquid from a liquid fuel cell.

63. A packaged combination for providing a metal hydride containing liquid for use with a fuel cell, wherein the combination comprises a first container and at least one second container, the first container containing a concentrate which comprises at least one metal hydride compound, a polar solvent, and at least one hydroxide ion providing compound, and has a hydroxide ion concentration of at least about 8 moles per liter, and the at least one second container containing a solvent in an amount sufficient to result in a hydroxide ion concentration of not higher than about 7 moles per liter of a mixture of the solvent in the at least one second container and the concentrate in the first container.

64. The packaged combination of claim 63, wherein the combination is associated with instructions to combine the concentrate in the first container with at least a part of the solvent from the second container.

65. The packaged combination of claim 64, wherein the concentrate comprises at least one of NaBH_4 and KBH_4 , water and at least one of NaOH and KOH .

66. The packaged combination of claim 63, wherein the solvent in the at least one second container comprises at least one additive for the fuel.

67. The packaged combination of claim 66, wherein the additive is selected from plasticizers, detergents, stabilizers for the at least one metal hydride compound, and antifreeze.

68. The packaged combination of claim 63, wherein the solvent in the at least one second container comprises at least one of an aliphatic and an aromatic amine stabilizer for the at least one metal hydride compound.

69. A method of reducing the decomposition of a fuel for a liquid fuel cell during storage of the fuel, wherein the method comprises storing the fuel as the concentrate of claim 1 and diluting the concentrate to prepare the fuel only before using the fuel in the fuel cell.